Zero to OS in 20.2 Seconds

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Overview

The typical home PC user's first impression of a new system is the boot process. A beep, some disk activity, a splash screen, and more than 60 seconds later the typical PC is ready to go. Many users take advantage of this interval to grab a second cup of coffee or check their phone messages. "Type-A" personalities have been known to leave their PCs on all the time.

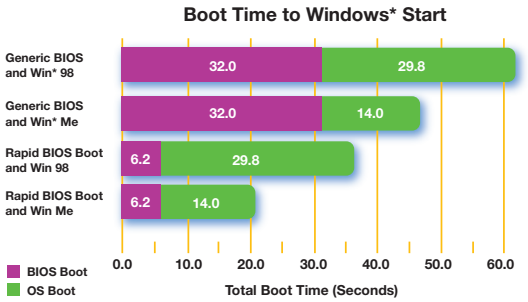
For a typical PC, approximately half of the boot interval is used by the BIOS to initialize the display and input devices, perform Power-On Self Test (POST) functions, scan system buses and main memory, and so on. In an effort to improve the user experience by shrinking the boot interval, Intel has optimized the BIOS code on it's Desktop Boards to eliminate redundancies and streamline the boot process.

In PCs with Intel® Rapid BIOS Boot, Windows Millennium Edition* operating system, and selected hardware, boot times as short as 20 seconds have been observed. (Bench tests performed at OEM Platform Solutions Division, Intel Corporation, June 15, 2000. See "Test Results" section for bench test details.) It's an advance in PC ease of use with important benefits for OEMs, integrators, and end users alike.

Faster Boots

One of the ways to make PCs more "appliance-like" and user-friendly is to cut down the boot interval. Three major factors affect boot time.

- *BIOS optimization.* Intel Rapid BIOS Boot reduces POST time by about 25 seconds, reducing the time to Windows* launch by approximately 50 percent (bench tests performed at OEM Platform Solutions Division, Intel Corporation, June 15, 2000). See "Test Results" section for bench test details.
- *Hardware configuration.* Monitor warm-up and synchronization rates, hard drive spin-up, and CD-ROM initialization all take time. For this reason, building a fast-booting PC is also a matter of choosing the right hardware. A legacy-reduced PC with a fast spin-up hard drive is recommended. Having the floppy drive as the first boot device can add several seconds to boot time.
- *Operating system optimization.* With Microsoft's forthcoming Windows Millennium Edition (Windows Me) operating system, the time needed to boot the OS has been cut to about 15 seconds, compared to 30 seconds for Windows 98. See "Test Results" section for bench test details.



In this test, Intel® Rapid BIOS Boot resulted in an 80 percent reduction in POST time and a 56 percent reduction in the time to Windows Millennium Edition* launch

Test Results

The bar graph illustrates the results of a comparison between a PC with Intel Rapid BIOS Boot and an otherwise identical system with a generic BIOS. Both systems were equipped with Windows Millennium Edition operating system, a 733-MHz Intel® Pentium® III processor, 128 Mbytes of RAM, and a 5,400-RPM hard disk. The tests were repeated for Windows 98. Boot times may vary with system configuration. (Performance tests and ratings are measured using specific computer systems and/or components and reflect the approximate performance of Intel® products as measured by those tests. Any difference in system hardware or software design or configuration may affect actual performance.)

No Trade-offs

Improved boot performance was achieved through BIOS code optimizations, not trade-offs in functionality. Here is a summary.

- *Improving task parallelism.* In traditional versions of BIOS, the tasks of initializing the hard disk, initializing the CD-ROM, scanning the Universal Serial Bus, displaying the splash screen, and clearing system memory occur in series. Initiating these tasks to run in parallel can save time.
- *Removing redundant code.* Legacy BIOS code can contain instructions for functions that may also be performed by the operating system during the boot process. Eliminating these redundant functions from BIOS can save more time.
- *Improving efficiency.* Most of the time, a system boots from the hard drive rather than from the floppy drive. By default, Intel Rapid BIOS Boot does not perform a seek for floppy media thereby saving a few seconds during the Power-On Self Test.
- *Legacy reduction.* Disabling or eliminating the floppy drive entirely can also save boot time.

Express BIOS Update

For argument's sake, let's say you have an older Intel® Desktop Board and would like to upgrade the BIOS to Rapid BIOS Boot. What if that system is legacy reduced and doesn't have a floppy drive? Intel® Express BIOS Update is a Windows-based utility available from Intel's Developer site which dramatically simplifies the task of updating system BIOS.

Intel Express BIOS Update is a 1-Mbyte executable file that can launch from within the operating system on the user's PC. The user is no longer required to boot to DOS, install the file on a floppy disk, or perform multiple system reboots. After downloading Express BIOS Update, simply double-clicking on the application leads the user through an installation wizard which automatically shuts down the system, flashes the BIOS, and reboots to the OS.

Other than its inherent ease of use, a significant advantage of Intel Express BIOS Update for system integrators and resellers is that it can simplify or reduce tech support requirements by supplying an automated OS present utility for systems with the Intel® 810, 815, and 820 chipsets. Tech support would typically have to step the user through the complicated tasks of creating a bootable floppy disk, extracting the BIOS files to a temporary directory, copying those files to the floppy, booting to DOS, running the Update program, and rebooting the system.

Additional Benefits of Rapid BIOS Boot

For OEMs. Manufacturers typically perform a number of tests that require a system reboot. Time savings in the boot process can save significant amounts of money in testing and fixture costs, or permit manufacturers to conduct additional tests and increase throughput. Using Intel Rapid BIOS Boot also enables system integrators to meet or exceed the seven-second BIOS POST standard contained in the PC 2001 System Design Guide.

For end users. Many end users and even some resellers have the perception that slow boot performance equals slow system performance, even in some of today's best-performing PCs. Therefore, reducing boot times results in increased user satisfaction.

Summary

Intel Rapid BIOS Boot can reduce POST time by more than 80 percent and reduce the time to Windows launch by more than 50 percent. See "Test Results" section for bench test details.

BIOS post times of 6.2 seconds have contributed to boot intervals as short as 20.2 seconds being observed in PCs equipped with Intel Rapid BIOS Boot, Windows Me, and optimized hardware.

For optimum boot performance, Intel recommends the use of Intel Desktop Boards that support Intel Rapid BIOS Boot, the optimization of system and hardware drivers, an optimized operating system, and hardware components with the fastest available spin-up times. Together, these steps will improve ease of use and make the PC experience more rewarding for end users.

More Info

For technical details on BIOS and faster booting PCs, read the BIOS Requirements section in Chapter 3 (PC System) of the PC 2001 Design Guide. In the near future, the OEM Platform Solutions Division of Intel will release a white paper describing the specifics of optimizing the BIOS as it relates to boot speed.

Use Intel Express BIOS Update to download the latest BIOS files for upgrading compliant systems to Intel Rapid BIOS Boot. You can download a BIOS Upgrade at the Intel® Desktop Boards Web site.

Author Bio

Justin Whitney is a senior product marketing engineer within the Intel Architecture Marketing Group. His project responsibilities have included Intel Rapid BIOS Boot, Intel Express BIOS Update, and the Superconducting Liquid Cryogenic Level Sensor, for which he holds a patent. Justin holds a B.S. in mechanical engineering from Northwestern University.

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